THE ROLES OF TAIWAN GOVERNMENT POLICY AND RESEARCH INSTITUTES IN PROMOTING INNOVATION PRACTICES IN ELECTRONICS INDUSTRY: A CASE STUDY

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DECLARATION

I hereby declare that the project is based on my original work except for quotations and citation which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at USM or any other institutions.

(Signature):

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Date: 28/ June/ 2012

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LIST OF KEYWORDS AND ABBREVIATION

EMS	Electronics Manufacturing Services
GDP	Gross Domestic Product
HSP	Hsinchu Science Park
ICT	Information and Communication Technology
IT	Information Technology
ITRI	Industrial Technology Research Institute
LED	Light Emitting Diode
MNC	Multinational Corporate
NCTU	National Chiao Tung University
NIS	National Innovation System
NTU	National Taiwan University
NTHU	National Tsing Hua University
OBM	Original Brand Manufacturer
ODM	Original Design Manufacturer
OEM	Original Equipment Manufacturer
R&D	Research and Development
SME	Small Medium Enterprise
UN	United Nations
VP	Vice President
%	Percentage
NTD	New Taiwan Dollar
US$	United States Dollar

ABSTRAK

Intervensi kerajaan Taiwan melalui dasar Sistem Inovasi Kebangsaan (SIK) dan institusi-institusi penyelidikan telah menghasilkan industri elektronik tempatan yang berjaya. Banyak pembekal-pembekal elektronik komponen dan barangan, dan juga pembuat-pembuat barangan teknologi maklumat yang menyokong pasaran global telah dihasilkan. Globalisasi yang giat juga telah mencetuskan persaingan hebat bagi bekalan barangan-barangan elektronik. Ini menyebabkan Taiwan industri elektronik kehilangan daya saing nyata kepada negara-negara lain seperti Korea, Singapura dan Malaysia.

Kes kajian penerokaan ini adalah untuk menganalisis dasar Taiwan SIK, sama ada ia masih memenuhi keperluan terkini pembangunan dan cabaran syarikat-syarikat kecil and sederhana elektronik tempatan (SKS), dengan giat menggalakkan amalan inovasi dalam industri. Sebab lebih daripada 90% syarikat-syarikat elektronik Taiwan ialah SKS, faedah perniagaan bagi penglibatannya dengan dasar kerajaan SIK akan dianalisis secara terperinci. Kes kajian ini melibatkan sesi temuduga dan sesi pemerhatian bersama wakil-wakil syarikat ABC yang menghasilkan barangan-barangan asas getah untuk alat-alat elektronik di Taiwan. Kes kajian melibatkan pengumpulan data bagi pengalaman penglibatan kakitangan-kakitangan syarikat dengan dasar kerajaan SIK. Data ini digunakan untuk menganalisis keberkesanan dan kecekapan dasar Taiwan SIK. Cabaran-cabaran intervensi kerajaan dibincangkan selepas analisis SWOT. Akhir sekali, cadangan-cadangan untuk dasar kerajaan Taiwan SIK dan SKS elektronik ditengahkan bagi memperbaiki amalan inovasi dan faedah keuntungan pada masa akan datang.

ABSTRACT

Taiwan government intervention through National Innovation System (NIS) policy and research institutes, produced success local electronics industry with many components manufacturing, OEM and Information Technology products makers to support global markets. High speed of globalization triggers continual electronics products supply and demand competition, which might cause Taiwan electronics industry losing its competitive advantages to others emerging countries like Korea, Singapore and Malaysia.

This exploratory case study is to analyze Taiwan NIS policy whether it still supports the development needs and challenges of local electronics SME, by promoting innovation practices in the industry. Since over 90% of Taiwan electronics firms are SME, business and technical benefits of the SME engagement with government NIS policy to be analyzed in detail. The researcher conducted on-site interviews and observations with department representatives of Taiwan ABC High Technology Corporation, who produces rubber base products for global electronics gadgets. The field case study gathered SME personnel engagement experiences with government NIS policy which to be used to analyze the effectiveness and efficiency of Taiwan NIS policy. The benefits and challenges of the government intervention are highlighted after the SWOT analysis. Finally, constructive recommendations to both Taiwan government NIS policy and electronics SME, for better innovation practices and business gains in future.

CHAPTER 1

INTRODUCTION

1.0 BACKGORUND OF THE CASE STUDY

The success of Taiwan government intervention to create and grow domestic industry through their National Innovation System (NIS) policy is one of the best role model for the world today. Taiwan has high reputation in world electronics industry, especially in semiconductors, display and information technology (IT) sectors (Dodgson, Mathews, Kastelle, & Hu, 2008). The government NIS policy involved establishing pioneering research institutes such as Industrial Technology Research Institute (ITRI), research universities and Hsinchu Science Park (HSP) to promote technology diffusion from advanced countries and spin-off of new company for technology and competency transfer.

Taiwan research institutes also have additional roles to encourage the formation of close collaboration network among Taiwan domestic firms. Previous multiple researches showed that government initiatives are key success determinants of innovation network collaboration in related industry, such as Sematech in United States, VLSI in Japan, and ESPRIT and EUREKA in Europe (Dodgson, et al., 2008). Sematech (Semiconductor Manufacturing Technology) for example was formed in 1987 to promote cooperation between United States government and local semiconductor manufacturers by leveraging resources and risks for the industry growth. It later gained greater success with the participation from Asia and Europe international integrated circuits chip makers in the consortia.

Innovation is undeniable a key factor of nations' sustainable economic growth, which eventually affects its long run quality of living standard and productivity. Porter and Stern described evolvement in developed countries as below (G. T. R. Lin, Shen, & Chou, 2010):"The challenges of a decade ago were to restructure, lower costs, and raise quality, and also continuous operational improvement is a must in advanced countries; but more importantly the advantage must come from the ability to create and commercialize new products and processes, by changing technological frontier faster than competitors". In organization perspective, innovation is important in promoting corporate learning culture, enhance competencies and capabilities, and also create better persistance to future market competition environment which are highly uncertainty, risk and volatility (Skerlavaj, Song, & Lee, 2010).

In electronics industry, the success of continual innovation is examplified by popular electronics gadgets maker, Apple Computers who has created ultra success invention of iPod, iPhone and iPad electronics gadgets, which have significantly enhanced the company profitability and market share (Chou & Chou, 2011).

1.1 PROBLEM STATEMENT

Taiwan government intervention in electronics products industry has successfully internationalized their high technology industry to compete in global market environment, and at the same time enhanced local social-economic development. In Taiwan, the share of the information technology and electronics industry value added manufacturing grow from 11% in 1981 to significant 46.7% in 2006. More specifically, Taiwanese companies are third largest semiconductor producer in the world with their international export sales of integrated circuits (IC)

increased from US$2504.6 billion in 2006 to US$2708.0 billion in 2007 (Wang, Hsu, & Fang, 2008).

Taiwan National Innovation System (NIS) consists of research institutes and universities, and also collaboration innovation network of public and private firms. The main functions of research institute and university are to support NIS activities which have been very successful. So far the research institutes and universities not only created new industry and facilitate continual growth, encourage good relationship among all small-medium enterprise (SME) and multi-national corporate (MNC) to promote collaborative innovation supporting activities such as R&D alliances, R&D consortia, research partnerships and innovation network (Dodgson, et al., 2008).

This exploratory case study analyze what Taiwan electronics industry SME can leverage from their local research institutes to promote and develop sophisticated products innovation, with influence of Taiwan government NIS. The successes and challenges faced by the SME with engagement to Taiwan research institutes and government NIS policy to be explored in-depth. For government policy influence, the study will cover the industry development guidelines, technical and management skill assistance, financial assistance, innovation networks alliance encouragement, others mode of linkage between government and the industry. For research institutes influence, R&D cooperation modes (Patents, IP and royalties), financial investment linkage, technology transfer, technical and management employee competency and marketing strategy assistance. Then the SME benefits gained with their engagement to government policy and research institutes, in term of new products creation and acceptance, number of patents or intellectual property right generation, sales revenue,

profitability and market share growth to be studied. The SME is also given opportunities to recommend any proposal for company performance enhancement, by improving linkages with Taiwan government NIS.

The brief problem statement for this case study is to explore whether Taiwan government NIS and research institutes manage to promote domestic electronics products innovation and develop profitable industry, especially for local SME. The case study also provides constructive recommendations to Taiwan government NIS and research institutes, to further boost linkages and innovative practices with local electronics industry.

1.2 RESEARCH QUESTIONS

The case study four key research questions are as below. Research questions are necessary to guide researcher gathering relevant, accurate, and purposeful information which to be analyzed to support case study problem statement. Most data involved will be from secondary data reviews, interviews and observations sessions during field work visit to the Taiwan SME.

- ✓ *What are the roles of the Taiwan government NIS policy in promoting Taiwan electronics product innovation?*
- ✓ *What are the roles of the Taiwan research institutes in promoting Taiwan electronics product innovation?*
- ✓ *What are the significant benefits gained by the SME, with the influence of Taiwan government NIS policy and research institutes?*
- ✓ *What are the areas that the SME can further enhance their company competitive advantage?*

The research questions explore the details of Taiwan government NIS policy and research institutes influence to the SME, and also the perceived and actual gains by the SME during the engagement process to improve innovative practices. The first two questions focus on understanding of major roles by Taiwan government NIS policy and research institutes, from the understanding and knowledge of the SME departments' representatives. A Taiwan local electronics industry SME is selected for the case study. Third question is about benefit gains by the SME departments with the innovation practices engagements. The last question is for the SME representatives to provide recommendations to improve overall competitive advantages, from the perspective of their engagement with Taiwan NIS policy and research institutes.

1.3 CASE ISSUES AND SIGNIFICANCE OF STUDY

In this case study, there are four case issues identified as below. The main purpose of the case issues are to link results of the research questions to more general perspective, so that the analysis results, findings and recommendations can be found useful and leveraged by others company involved in similar industry. The ability of the case study findings and recommendations to be applied by others company and industry later is important for the significance of the study.

- ✓ *In what areas Taiwan government NIS policy bring influence to their local electronics industry, and also their challenges.*
- ✓ *In what ways Taiwan research institutes are assisting their local electronics industry, in promoting product innovation, and also their challenges.*
- ✓ *In general whether Taiwan SME gain benefits to improve company performance with the Taiwan government NIS policy and research institutes engagements.*
- ✓ *In overall whether Taiwan SME able to transform into better competitive advantages and to face high speed globalization and technology change.*

The detail understanding, findings, and recommendations of what Taiwan NIS policy and research institutes contribute to the development of the electronics industry can be learned and leveraged by other electronics companies. Furthermore, smaller scale SME and MNC normally are less chance to achieve significant success by own entrepreneurship efforts, without support from local government policy and research institutes.

1.4 THE CASE STUDY MODEL

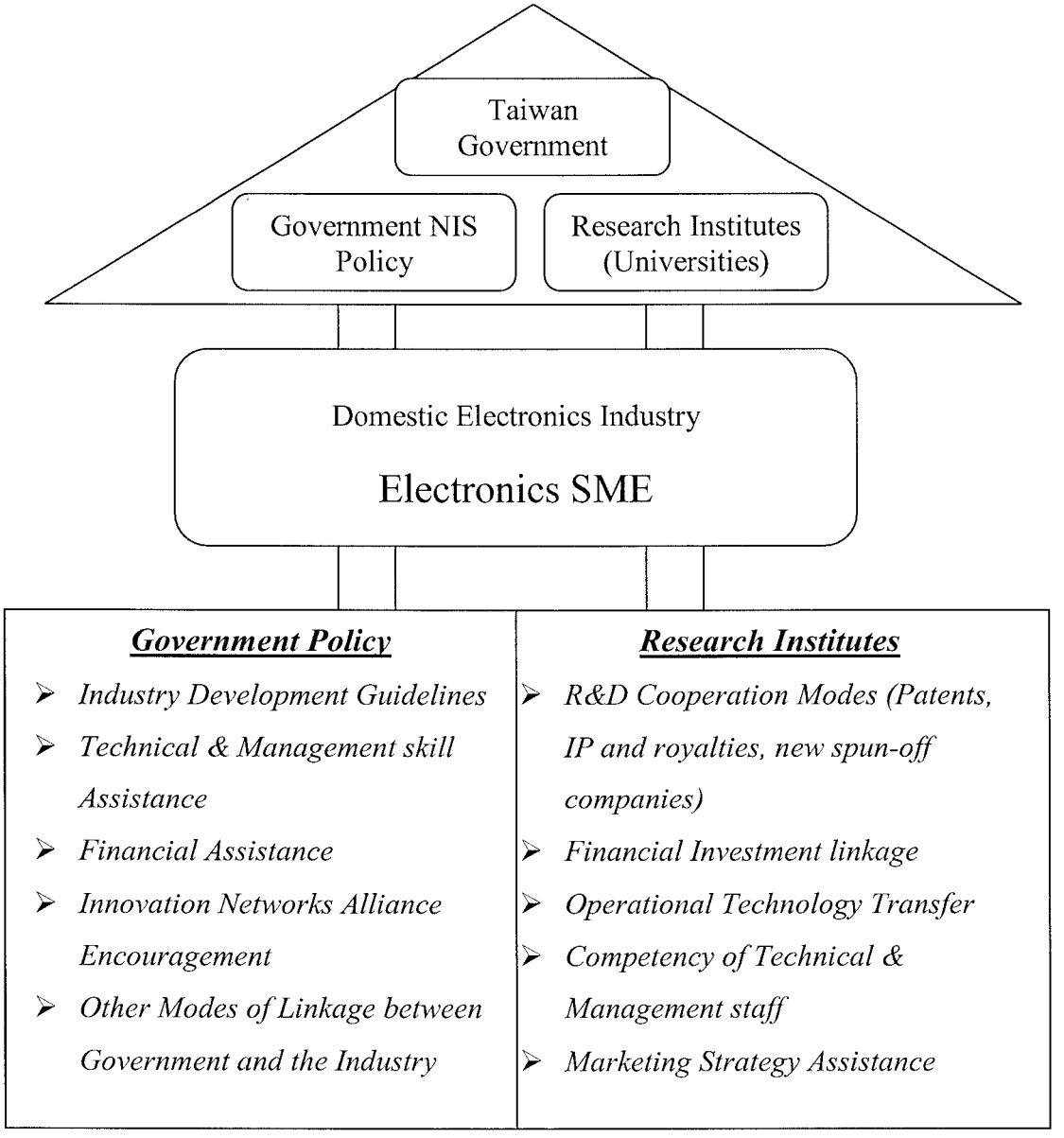

Figure 1.1: Case study research model. A electronics SME was selected to study roles effectiveness of Government NIS policy and research institutes

1.5 THE STRUCTURE OF CASE STUDY

- ✓ *In Chapter 1 Introduction*, the background of the case study, problem statement, research questions, case issues and significance of the study, and overall summary of case study model were presented.
- ✓ *In Chapter 2 Country Analysis*, a brief Taiwan country profile regarding its brief history, politic, economy and social has been referenced and studied.
- ✓ *In Chapter 3 Industry Profile*, the background of Taiwan electronics industry, its brief development history and latest development were discussed accordingly.
- ✓ *In Chapter 4 Company Analysis*, an introduction to ABC High Technology Corporation, with its related information such as organization structure and each department roles and responsibilities; company vision, mission and quality policy; products and technology; product development, markets analysis, rivalry competitor analysis, competitive advantage; short and long term business development plans and also financial analysis have also been presented.
- ✓ *In Chapter 5 Literature Review*, various areas regarding the case study title have been referenced like innovation generation; government innovation policy; encourage R&D collaboration; social influence on innovation adoption; operationalized the organization innovativeness; measurement of innovation performance and capacity; determinants of Taiwan high-tech internationalization; and also risks in innovation. Those topics are important to ensure proper design and plan of overall case study analysis.

- ✓ *In Chapter 6 Methodology*, various data collection process of on-site interviews and observations are discussed together with "Data Source, Methods and Justifications" tool, data collection framework and timeline. Interview questions, analysis tool of SWOT and its proposed action plan framework have been discussed.
- ✓ *In Chapter 7 Case Write-Up*, interviews and observations data findings after on-site field study in Taiwan. Topics included are importance and understanding innovation practices in Taiwan; influence of Taiwan government NIS policy and research institutes; any benefits gained by the SME; and recommendations for improvements.
- ✓ *In Chapter 8 Case Analysis*, SWOT analysis carried out to analyze the case study data findings from literature reviews and interviewees feedback and later to come out proposed action plans for Taiwan NIS policy and research institutes.
- ✓ *In Chapter 9 Recommendations and Conclusions*, Constructive recommendations provide to Taiwan government NIS policy and research institutes, and also the electronics SME to better promote the innovation practices and benefits gains by the local electronics industry. Last and not least, the case study limitations and future study recommendations to be discussed.

CHAPTER 2

COUNTRY ANALYSIS

2.0 INTRODUCTION TO TAIWAN COUNTRY PROFILE

Taiwan is a small island country with total land area of 35,980 square kilometers (about quarter size of peninsular Malaysia), located in Eastern Asia, off the southeastern coast of China and north of the Philippines islands. Taiwan islands are surrounded by East China Sea, Philippine Sea, South China Sea, and Taiwan Strait. The country expose to natural hazard of typhoons between July and September and risk of massive earthquakes hit. With limited natural resources, Taiwan only has small amount of coal, natural gas, limestone, marble and asbestos which all not mean for exporting (CIA, 2011).

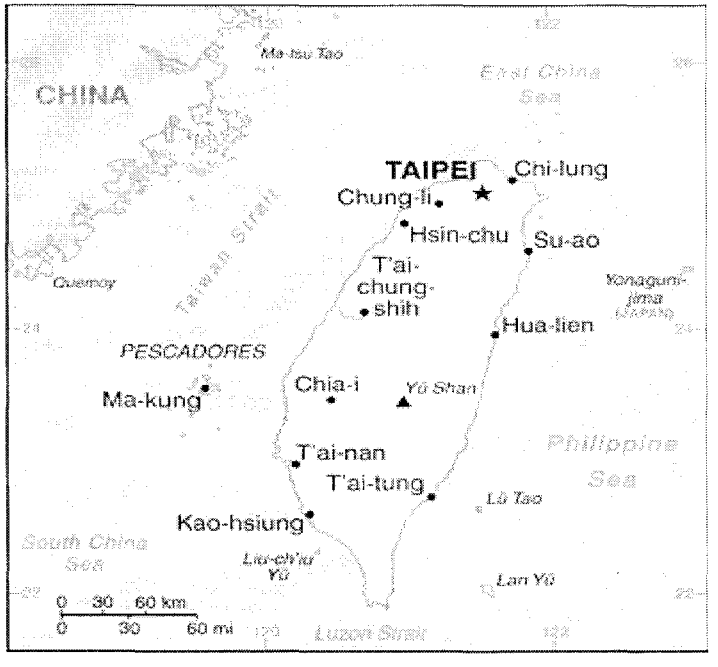

Figure 2.1: Taiwan island map (Source: CIA, 2011)

Taiwan successfully transforms its major industries, from previous agriculture base to one of United Nations (UN) highly recognized Newly Industrialized Emerging (NIE) country. Together with Hong Kong, Singapore, and South Korea, they are jointly named as the four "Asian Tigers", who have accomplished high Gross Domestic Product (GDP) growth since 1980s.

2.1 BRIEF HISTORY OF TAIWAN

Taiwan was under Japan occupation since 1895, after the military defeat in China-Japan war. In year 1945, Taiwan was under China control again after Japan was defeated in World War II. But in 1949, Chinese Civil War divided Taiwan islands and China mainland into two political, social and economical different countries. The China Communists military victory over Nationalists army forced 2 millions Nationalists withdrawn to Taiwan islands who gradually establish separate democratic government over the decades, while Communists military forces launch new strong communists government in mainland China (CIA, 2011). But since then over decades, China still claims Taiwan as its territory and sovereign, and Beijing has threatened to use political and military forces to control Taiwan again, if Taiwan announced separation independence from China.

2.2 POLITICAL ENVIRONMENTS

Under the leadership of Nationalist Party, Taiwan adopts capitalism with free market economy while mainland China implements communism with centrally planned economy (Shih & Chang, 2009). In 2000, Democratic Progressive Party (DPP), under presidency of Mr. Chen Shui-Bien who has strong advocates of Taiwan as independence sovereign from China, defeated Nationalist Party (or Kuomintang, KMT) in general election to become Taiwan ruling party. DPP has open policy of resisting unification and rejecting "One China" policy with mainland China. This situation had created political tense and conflicts, and believed that China has more than 1000 missiles aiming at Taiwan islands at all time (CIA, 2011).

But in 2008, KMT under leadership of Ma Ying-Jeou, re-gains control over Taiwan ruling after won the general election in March 2008. The president Ma has policies to improve long stagnant bilateral China-Taiwan political relationship, by prioritizing normal social and economic relations with China (Jennings, 2008). The increasing political stability and closer bilateral China-Taiwan open up brighter opportunities for Taiwan government NIS policy and research institutes to provide significant contributions to electronics industry developments.

2.3 ECONOMY ENVIRONMENTS

Taiwan electronics materials industry and machinery equipments industry were jointly contributing over 70% of Taiwan GDP growth, and was primary economic development driver (CIA, 2011). According to World Economic Forum, The Global Competitiveness Report 2010-2011 that Taiwan was one of the 15 countries transitioning from stage 2 'efficiency driven' development to stage 3 'innovation driven'. This means that innovation development already an embedded culture in Taiwan societies and industries, and as the country's top development priority. The Global Competitiveness Index (GCI) ranked Taiwan 13th in the world and they were 4th in Asia, behind Switzerland (1st), Singapore (3rd), United States (4th), Japan (6th), Hong Kong (11th), but ahead of Korea (22th), Malaysia (26th), and China (27th). The GCI is a comprehensive index of measuring national competitiveness by referring to set of institutions, policies and factors that determine country productivity level to gain sustainable economy growth. The report also mentioned Taiwan economy competitiveness can be improved if their institutions, financial market development and labor market efficiency are enhanced (CIA, 2011).

Next figure shown Taiwan GDP per capita based on Purchasing Power Parity (PPP), which have increased significantly by 258%, from US$10,000 to US$35,800 in 20 years from year 1990 to 2010. Taiwan GDP growth trend from 1980 to 2008 was found exactly correlated with developed countries. This denoted high possibility that Taiwan implements close benchmarking approach to developed countries in social-economic and military capabilities development, and also its high export dependent to developed countries.

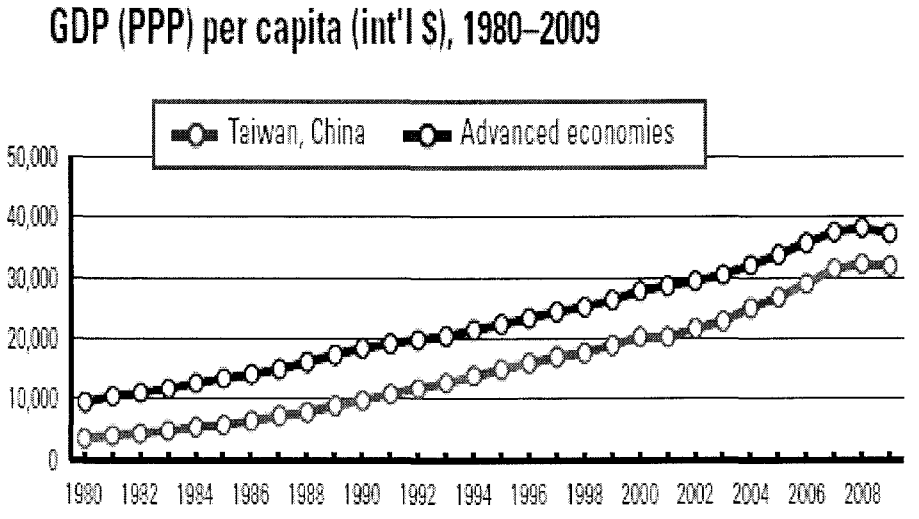

Figure 2.2: GDP Trend Comparison of Taiwan and Average Advance Countries (Source: The Global Competitiveness Report, 2010-2011)

Since year 2008 and under ruling of KMT, bilateral China-Taiwan economic relationship significantly enhanced, and China is Taiwan's largest host nation of foreign direct investment (CIA, 2011). This really a positive approach since China has abundance of human capital, market demands and material resources as needed by Taiwan for electronics industry developments. The bright economic prospect of Taiwan has increased the research institutes opportunities to play more crucial roles in electronics industry development.

2.4 SOCIAL ENVIRONMENTS

CIA Factbook estimated Taiwan total population 23 million in July 2011, and 73.4% of them contribute to labor force (age between 15 and 64 years old). Total 98% of Taiwan populations are Han Chinese and only 2% are Taiwan islander natives. Similar to other developed nations, Taiwan fertility rate was low at 1.15 children born per woman, which far below replacement rate of 2.1. Replacement rate refers to minimum fertility rate to avoid population decline and ensure continuous supply of productive labor force (Ball, et al., 2010). With population growth rate of 0.193%, Taiwan is facing population decline, population aging, labor shortage, domestic goods and services demands decrease, and tax revenues decline problems, which seriously harm the long run economy growth. Taiwan literacy rate is good at 96.1%. Mandarin Chinese is the country's official language, but unlike mainland China, Taiwan maintains traditional Chinese written fonts (CIA, 2011). Taipei (located in northern area) is the capital of Taiwan with 2.6 million populations. Green practices are applied in daily Taiwanese life, including in manufacturing processes and management. Taiwanese believe environmental friendly production processes will save money and build healthier working environment (CAN, 2010). These advocates were agreed by leading Taiwan corporates such as AU Optronics Corp (LCD display producer), and TSMC and UMC (semiconductors producers).

With declining local labor force and market demands due to shrinking population, Taiwan NIS policy and research institutes have more responsibilities to create and boost new technology, industry and innovation.

CHAPTER 3

INDUSTRY PROFILE

3.0 TAIWAN ELECTRONICS INDUSTRY BACKGROUND

Taiwan electronics industry is considered latecomer compare with developed countries such as United States and Japan. Taiwan companies are pursuing primary strategy of catching up "new to the country" innovation; compare with advanced countries who are employing strategy of "new to the world" innovation practice to maintain their leading position (Mathews & Hu, 2007). So, Taiwan is creating own competitive advantages, reputations and brands; through mimic design, manufacturing and marketing capabilities of others, to capture better global market share.

3.1 BRIEF DEVELOPMENTN HISTORY OF THE ELECTRONIS INDUSTRY

In 1972, United States president Richard Nixon visited Beijing to begin official political United States-China relationship in international arena, and this has caused sharp reduction of countries recognizing Taiwan as independent country in United Nations (UN), which the reduction from originally 62 countries in 1971 to just 23 countries in 1977. With this political crisis coupled with Taiwan economic crisis in 1974, Taiwan achieved GNP growth of only 1.1% with hyper-inflation rate of 40% and trade deficit exceeding US$1 billion (Tzeng, 2010). So in 1973, Taiwanese government established Industrial Technology Research Institute (ITRI), with modal of US$28,000 in Hsinchu area, to respond to the internal economic and political crisis,

and to promote high technology electronics and semiconductors industry development (Tzeng, 2010).

In 1974, ITRI created Electronic Research and Service Organization (ERSO) to absorb foreign technology and transfer to local firms later. ERSO built Taiwan's first model shop of wafer fabrication and trained engineers who later established own private firms (G. T. R. Lin, et al., 2010). In 1980, ITRI transferred CMOS technology to setup private corporate of United Microelectronics Corporation (UMC) with initial capital of US$12.5 million, to fulfill domestic electronics market demand of semiconductors. After 1985, Taiwan focus on application-specific IC (ASIC) manufacturing, with big success in calculators application specific ICs. So, Taiwan calculator producers can utilize lower cost local raw IC, rather than need to import from Japan. Calculator products manufacturing is one of the Taiwan pioneer electronics industry, and it served as beginner for Taiwan to engage in higher technology products in communication and computing (Tzeng, 2010).

3.2 LATEST DEVELOPMENT OF THE ELECTRONICS INDUSTRY

Taiwan is a global producer of communication and computing products, who possess strong R&D (research and development) and innovation capabilities. Taiwan manufacturers produced more than three quarters of world motherboards, more than 90 percents of world notebooks and nearly 70 percents of display monitors, from international brands like Acer, Asus, and BenQ. Acer replaced Dell as world second largest producers of personal computers in revenue, and Asus is world top three notebooks computers producer (India Prwire, 2010). For Flat Panel Display (FPD) industry, Taiwan companies were able to enter international markets during the

industry down-turns, which mean Taiwan firms have used down-turn entry strategy to penetrate global markets (Dodgson, et al., 2008). Taiwan firms normally used existing technology acquired from foreign advanced companies during down-turn, and further innovate into better competitive products.

Taiwan electronics companies normally are not pioneering technology leaders. The continual improvement and progressive innovation are crucial for Taiwan companies to compete with advanced global competitors from United States, Japan and Korea.

3.3 INTRODUCTION TO TAIWAN RESEARCH INSTITUTES

Taiwan research institutes are considered having important roles to promote electronics industry development. Examples, Industrial Technology Research Institute (ITRI), National Chiao Tung University (NCTU), National Tsing Hua University (NTHU), and National Taiwan University (NTU) to be discussed briefly.

3.3.1 INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE (ITRI)

Established in 1973, ITRI is government supported technology and scientific research institute, mainly to develop innovation skills (Dodgson, et al., 2008). As innovation intermediary, ITRI involves in developing local technology capabilities, which will then be spun-off into private electronics firms. The formation of Taiwan leading semiconductor company, TSMC (Taiwan Semiconductor Manufacturing Company) is one of the key success examples.

With estimated annual operating cost of US$500 million, ITRI is currently having 5000 R&D staffs (820 people with PhD qualification) from total 6000 employees. The institute research in the field of Information and Communication Technology (ICT), opto-electronics, chemical technology, precision machinery, biomedical technology, nanotechnology, and others advanced technology development for industrial application. In 2002, ITRI has more than 1000 US registered patents (Dodgson, et al., 2008). ITRI has the most patents awarded in Taiwan, with around 200 yearly at USPTO (United States Patent and Trademark Office) (Mathews & Hu, 2007). (Tsai, Hsieh, Fang, & Lin, 2009) also reported 2302 patent applications and 985 domestic and foreign patents obtained by ITRI in 2006. This has shown the significant contributions of ITRI to the Taiwan innovative development.

ITRI develops innovation knowledge by exploiting local innovation networks for technology diffusion, which means it encourages local firms to form alliance to retain local knowledge. The alliance cooperates to innovate and develop new products, but they will eventually compete with each others in domestic and international markets, which to create healthy competition environments. Taiwan Information Technology (IT) and Integrated Circuits (IC) industry are flourished from inception of ITRI (Dodgson, et al., 2008). Since the establishment of ITRI, total 13,000 former ITRI staffs have joint domestic and international electronics firms or have created own new firms (Dodgson, et al., 2008). By end 2005, ITRI has created more than US$2 billion R&D investment, and supported over 130 startups companies, and with total 694 technology inventions have been transferred to private companies worth US$41.56 million in 2006 (Tsai, et al., 2009). With ITRI influence, Taiwan is world leading semiconductor chips, computers and optoelectronic products producers,

with over 100 new companies spun off from ITRI, like UMC (United Microelectronics Corp) and TSMC (Taiwan Semiconductor Manufacturing Co) in semiconductor sector, Mirle Automation in industrial automation sector, and Phalanx Biotech in biotechnology and medical research sector (Mathews & Hu, 2007).

3.3.2 RESEARCH UNIVERSITIES

Taiwan universities are important source of nation's knowledge flows. Since late 1990s, Taiwan government has enacted universities roles in high technology research activities, and raise of county's innovation capacity. Taiwan universities have shifted focus from applied research to basic research learning, which meant universities are focusing on fundamental knowledge generating for country to move from rapid imitation approach to better innovation strategy (Mathews & Hu, 2007).

NCTU is one of the Taiwan oldest universities, who emphasize advance engineering research since its establishment in 1958. The university has contributed R&D skills human sources to ITRI and HSP. In order to collaborate better with private industry, NCTU has established Office of Research and Development in 1995-1996, to commercialize university's research and licensing its knowledge to industry. In 2004, about 70% of NCTU income was generated from royalties and licensing of intellectual property rights (IPRs), with licensing revenue of NTD10.7 million. NCTU patents awarded at USPTO is 8 in 2004 (Mathews & Hu, 2007).

NTHU is one of premier research universities in Taiwan, established in 1956. The university also operates a Research and Development Office. In 1998, NTHU has established another Office of Technology Service to manage commercialization of

IPRs and licensing activities. NTHU patents awarded at USPTO is 3 in 2004 (Mathews & Hu, 2007).

NTU is Taiwan rank one university for both teaching and research, founded during Japanese occupation in 1928. In 1996, NTU has established Commission on Research and Development to raise university research quality, assist faculty members to commercialize their research result, and develop small and medium size business. The innovation and incubation centers are established also to provide technical, management and infrastructure facilitation to university members to grow their SME business. It also assists research staff to obtain patents, copyright, technical know-how and facilitate the process of licensing and technology transfer. In 2001, NTU has established Innovation and Incubation Center (NTU IIC), to provide knowledge assistance to SME companies in the fields of electronics, information technology, automation, and biotechnology. In 2004, NTU's patents applications are 33 with licensing revenue of NTD26 million. NTU patents awarded at USPTO is 12 in 2004 (Mathews & Hu, 2007).

CHAPTER 4

ORGANIZATION PROFILE

4.0 INTRODUCTION OF ABC HIGH TECHNOLOGY CORPORATION

ABC High Technology Corporation is a Taiwan base company founded in 1989. They produce rubber base products for electronics products and gadgets. ABC is practicing continual new products research and development, and technology innovation to enhance company's competitive advantage in term of quality, cost effective and quick turn-around-time to serve global customers (ABC, 2011).

ABC started up in Taipei's Chung Ho City to produce self-adhesive rubber foot mats and rubber keypads. But just 2 years later in 1991, the company moved into new expanded plant in Taipei County's Tu Cheng City, with added manufacturing of industrial rubber products and P+R keypads for mobile phone application, to serve local Taiwan, United States, Europe and Japan market. In 1998, the company factory certified with ISO9000 and later certified with ISO14000 in 2006. In 2006, ABC acts as main holding company by having corporation relationship with Golding Profit Limited who holds URC and UTC companies. In 2008, the company's application as public company listing in Taiwan Stock Exchange (TWSE) approved by Securities and Futures Bureau (SFB). In May 2010, the company has moved to new factory in Taipei County's Tu Cheng City, but its affiliates URC and UTC operate in Kunshan and Shanghai China (ABC, 2011).

4.1 ORGANIZATION STRUCTURE

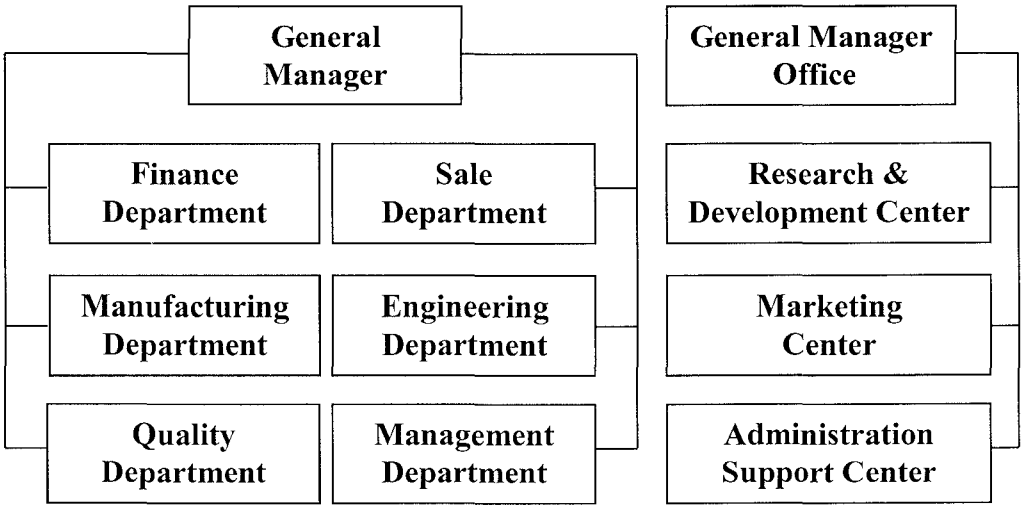

Figure 4.1: Organization chart of ABC High Technology Corporation
(Source: ABC, 2011)

ABC has rather flat organization structure, which all nine department Heads are either direct report to General Manager or The Office. With small organization and business nature, the flat organization enables high speed of business and technical decision making. But the General Manager has overall ownership to oversee company business and technical activities from all departments (ABC, 2011).

4.1.1 DEPARTMENT ROLES AND RESPONSIBILITIES

Below table listed key roles and responsibilities of each ABC department (ABC, 2011).

Table 4.1:

Roles and responsibilities of ABC Departments (Source: ABC, 2011)

Department	Roles and Responsibilities
Marketing	• Market research and product planning strategy. • Sales strategy planning.
Research and Development	• Product application and design development. • Support customer application issues.
Administration Support	• Human resources related administration and plan implementation. • Information system planning, information technology (IT) equipments repair and management. • Internet security implementation, ensuring IT system safety.
Management	• General management, fix assets and other physical properties management and maintenance. • Raw materials purchasing and manage outsourcing activities. • Inventory management, inbound and outbound logistic.
Finance	• Cash inflow and outflow, finance capital adjustment, bank fund raising. • Company accounting, cost calculation, budget planning. • Company financial reporting, financial analysis.
Sales	• Local and oversea sales and development. • Customer enquiry services, customer compliant handling.
Quality	• ISO quality system planning and maintenance. • Test engineering, technical support. • Quality policy, employee development and training.
Engineering	• Product structuring and handle customer application related issues. • Product approval, sample validation, tooling management, and product part numbering management.
Manufacturing	• Production planning and progress controlling. • Monitor production target and manufacturing yield.